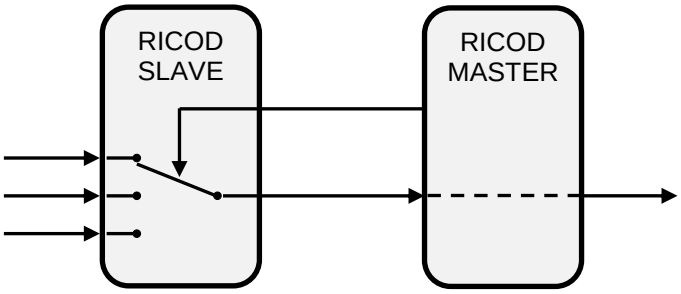
visual engineering
LIGHTWARE

Remote Input Control Over DDC



User's Manual

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1. Introduction

The main goal of Remote Input Control Over DDC (RICOD) is to control the remote Lightware transmitters attached to a router (local device). The control means input switching (select video and audio sources) and locking / unlocking the remote buttons / switches.

Info: *There is no possibility to send other kind of commands, including Lightware protocol commands or any other character sequence. The "RS-232 extension" function is out of the question.*

Info: *RICOD is Lightware's intellectual property and proprietary function. It works only with Lightware devices.*

2. RICOD capable devices

The RICOD functionality must be implemented in the firmware of the devices. (It can be implemented in the Lightware devices with more than one input ports.)

It is currently implemented in the following devices:

- UMX4x4-Pro, firmware version 1.2.4r and above
- WP-UMX-TP-TX100, firmware version 1.1.0r and above
- FP-UMX-TP-TX100, firmware version 1.1.0r and above
- UMX-TP-TX100R, with firmware version 1.1.6r and above
- MX-CPU2, with firmware version 3.3.5r and above*

** The MX-FR series modular matrix frames with MX-CPU2 processor boards (with firmware version 3.3.5r and above) support reduced RICOD capabilities: only MASTER mode is available and only by protocol commands. RICOD SLAVE mode and the front panel operation are not implemented.*

3. Operation

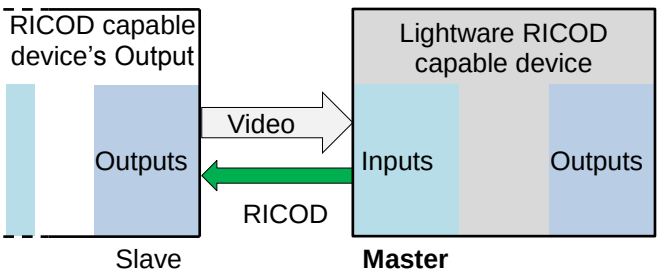
3.1. Master and Slave mode

First of all it is important to understand the direction of RICOD and the working modes.

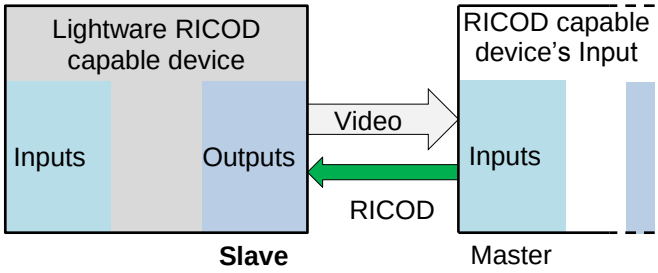
Lightware RICOD capable devices are able to send out remote switching commands on their video inputs towards another RICOD capable devices' video output and / or they can receive remote switching commands on their video outputs from another RICOD capable devices' video input.

One device can work as a Master or a Slave.

- Master - If a device sends out RICOD commands over its video input it works as a Master, like the device on the right side. The Lightware Matrices (e.g. UMX4x4-Pro) work as RICOD Masters typically.



- Slave - If a device receives RICOD commands over its video outputs it works as a Slave, like the device on the left side. In this case the devices are capable of receiving commands over their outputs (e.g. connected to another Lightware device) if the function is enabled. This means that the remote device is capable of being controlled from that given output. (The command affects only that output where the RICOD command was received). The Lightware transmitters (e.g. WP-UMX-TP-TX100) work as RICOD Slaves typically.



3.2. Factory defaults

After firmware upgrade the **Slave** mode is always **enabled** (commands from the Master devices are accepted and executed) and the **Master** mode is always **disabled.** This state will be caused by reloading the factory defaults with {FACTORY=ALL}, protocol command. For more information about reloading the factory defaults see the user's manual of the devices.

3.3. Enable / disable RICOD

Users can enable or disable the RICOD function for each input and output video port separately. For example, one can enable the RICOD on the 1st and the 2nd video input and the 1st and the 3rd video output port. RICOD is disabled on the other video input and output ports. Figure 3-1 shows this case. Video ports where RICOD is enabled are green.

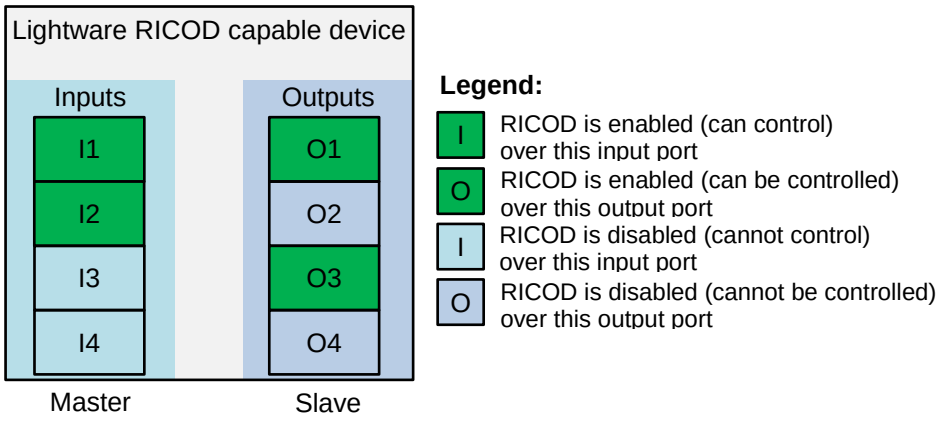


Figure 3-1. Enabling RICOD

The RICOD can be enabled or disabled by LW2 protocol commands for every Lightware device. (For more information see section *4* on page *8*.)

Another way to change RICOD state is available for devices which have front panel LCD. In this case users can change settings with front panel operation. The section *6.1* on page *11* introduces the UMX4x4-Pro front panel menu contents affected by RICOD.

3.4. Validity of RICOD

The last command will be saved for each input and will be preserved until a new command arrives or until the function is disabled. If the remote controlled device is

restarted, replaced or disconnected and connected again, then the command will be executed again. The command will take effect even if the local device (e.g. the UMX4x4-Pro) is restarted or the function is enabled again.

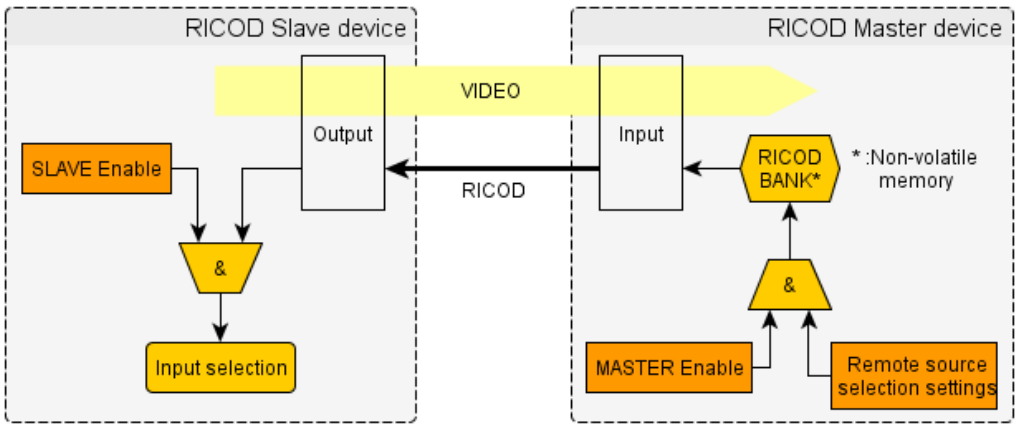


Figure 3-2. Working of RICOD

Info: *The communication between the devices is uni-directional, so there is no feedback from the remote controlled device.*

3.5. Locking the remote device

The intention of this feature is to prevent accidental or unwanted switching when the remote device is installed near to the end-users. The remote device can be locked by the local device via a RICOD command. The behavior is different for the video routers and for the extenders:

3.5.1. Extenders

If an extender (talking about transmitters, i.e. WP-UMX-TP-TX100) receives a lock command by the RICOD function, then it will disable the front panel switching buttons. The buttons are disabled until the device is disconnected (connection is detected by the Hotplug detect signal – which is carried by the DDC CAT cable when using CATx extenders) or the remote lock command is cleared by the local device. This can be done by turning off the RICOD function or by turning off only the lock command.

If a new device is connected which doesn't support RICOD commands then the remote lock will be disabled.

Note that when the buttons are disabled, then they don’t react at all - switching and unlocking are also impossible.

The transmitters are still able to receive and execute commands via their local control interface (e.g. RS232 or USB) while RICOD lock is enabled. The remote lock command affects only the buttons, but doesn't prevent the switching if it is commanded locally.

Locking operation flowchart

Buttons on the extenders can be locked by front panel operation or remotely, but the two ways of locking are not the same. If buttons were locked by a front panel operation, they can be unlocked by a RICOD unlock command followed by an unlock operation on the front panel.

To better understand the locking sequence, please study Figure 3-3.

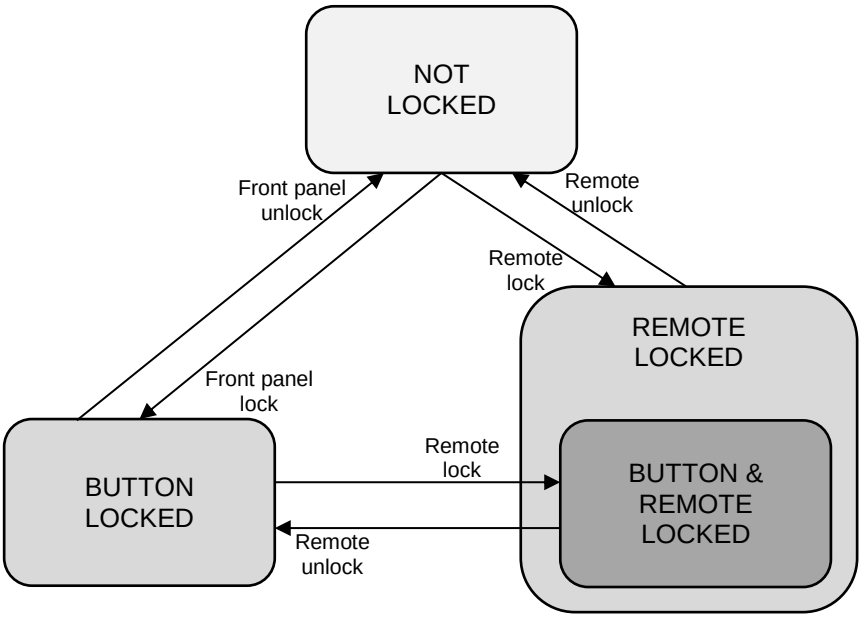


Figure 3-3. Locking flowchart of the extenders

3.5.2. Routers

The routers behave differently because locking the whole front panel is not reasonable. When the RICOD function is enabled for an output port (see RICOD_SLEN command in chapter *4.4.1* on page *10*) and a lock command is received over the same port, then the output port will be "output locked". This is the same output lock function as described in the manual of the router. The output lock is reported back by the protocol (is shown in the control software and in the web) and is displayed on the front panel. The output lock can be overridden and turned off by protocol or front panel.

If the output lock is enabled for a given port, a remote RICOD command is also able to turn it off.

Important! *The accepted RICOD command overrides the output lock function. If the RICOD function is turned on for a given output port, then the output lock condition can be changed remotely.*

4. Programmers reference

4.1. RICOD with protocols

The Lightware matrices are equipped with multiple router protocols.

Important! *RICOD works only with the Lightware protocol. The currently used protocol can be viewed or changed at any time via the matrix front panel or via protocol commands.*

4.1.1. Change (view) protocol on the front panel

Step 1. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 4 seconds. (light will go off)

Step 2. Press Control Lock button for 3 seconds (it lights in up red continuously)

Step 3. Press and keep pressed the Output Lock button. Now the active protocol is displayed: (view protocol) One source button lights up according to the current protocol:

- Source#1 lights: Lightware protocol active
- Source#2 lights: Protocol#2 is active

Step 4.

a) If you do not want to change the protocol, release the Output Lock button (view only).

b) If you want to change the protocol keep the Output Lock button pressed, and press the desired Source button.

Step 5. If the control protocol for any interface has changed then a beep will sound to notify the change.

4.1.2. Change (view) protocol via remote connection

Connect to the matrix through any control interface, then use the commands described in the Lightware protocol section of the device's user's manual.

View current control protocol

Description: Shows the current control protocol.

Format		Example	
Command	{P_?}	→	{p_?}
Response	(CURRENT●PROTOCOL●=●#<x>)CrLf	←	(CURRENT●PROTOCOL●=●#1) CrLf

Explanation: Protocol 1 is active here.

Legend: <x> stands for the active protocol.

Set current control protocol

Description: Sets the control protocol (Default is '1').

Format		Example	
Command	{P_x}	→	{p_1}
Response	(PROTOCOL●#<x>●SELECTED!) CrLf	←	(PROTOCOL●#1● SELECTED!)CrLf

Explanation: Protocol 1 is activated.

Legend: <x> stands for the active protocol.

Info: *For detailed information, see the user's manual of the devices.*

4.2. Lightware protocol description

The protocol description hereinafter stands for Lightware protocol.

The matrices accept commands surrounded by curly brackets - { } - and responds with data surrounded by round brackets - ( ) - only if a command was successfully executed. All input commands are converted to uppercase, but respond commands can contain upper and lower case letters as well.

Legend for control commands:

CrLf = Carriage return, Line feed (0x0D, 0x0A)

● = space character (0x20)

→ = each command issued by the controller

← = each response received from the router

4.3. RICOD MASTER commands

4.3.1. Set RICOD command on input

Description: Sets the RICOD command for the selected input port.

Format		Example	
Command	{:RICOD#<in>@<S/A>I=<A1><A2>;<B>;<C>;}	→	{:RICOD#1@SI=10;2;1;}
Response	(RICOD#<in>@<S>I=<A1><A2>;<B>;<C>;)CrLf	←	(RICOD#1@SI=10;2;1;)CrLf

Explanation: RICOD control is enabled on the first input port, which unlocks the remote device and selects the second video input and the first audio input port on it.

Legend:

<in>: **Input port number:**
Input number in 1 or 2 digit ASCII format (01,3,04 etc.)

<S/A>: **Affected ports:**
S = single selected input
A = all inputs

<A1> **RICOD enable parameter on the input:**
1: The RICOD function is enabled to this input port on the local device (where the command was given).
0: The RICOD function is disabled to this input port on the local device (where the command was given).

<A2> **Remote lock enable parameter:**
1: The front panel buttons (in case of transmitters) or the output (in case of video matrix) is locked on the remote device.
0: The front panel buttons (in case of transmitters) or the output (in case of video matrix) is unlocked on the remote device.

Info: *The remote lock function takes effect only if RICOD is enabled by <A1>.*

<B> **The selected video input:**
"**-**" (hyphen) = There is no video switch command.
"**A**" = Automatic input select must be performed on the remote device if available. (i.e. Autoselect function)
"**0**" (zero) = The output needs to be muted if available. (switch to zero)
"1" , "2" , .. , "80" (number between 1 and 80) - Use the given input number if available.

<C> **The selected audio input:**
"**-**" (hyphen) = There is no video switch command.
"**A**" = Automatic input select must be performed on the remote device if available. (i.e. Autoselect function)
"**0**" (zero) = The output needs to be muted if available.

(switch to zero)
“1”,”2”,..,”80” (number between 1 and 80) - Use the given input number if available.

Info: *If the first character of <A1><A2> is zero, then no command is sent, the RICOD function is disabled on this input.*

4.3.2. Query the set RICOD command on input

Description: Checks the status of the previously set RICOD command for the selected input port.

Format		Example
Command	{:RICOD#<in>@<S/A>I=?}	→ {:RICOD#1@SI=?}
Response	(RICOD#<in>@<S>I=<A1><A2>;<B>;<C>;)CrLf	← (RICOD#1@SI=11;1;1;)CrLf

Explanation: RICOD command was enabled on the first input port, which locks the remote device and selects the first video and audio input port on it.

Legend: Please read section 4.3.1 (Set RICOD command on input) on page 9.

4.4. RICOD SLAVE commands

4.4.1. Set RICOD slave status on output

Description: Enables or disables the reception of RICOD commands over the selected output port of the local device.

Format		Example
Command	{:RICOD_SLEN#<out>@<S/A>O=<num>}	→ {:RICOD_SLEN#1@SO=1}
Response	(RICOD_SLEN#<out>@<S>O=<num>)CrLf	← (RICOD_SLEN#1@SO=1)CrLf

Explanation: RICOD functionality is enabled on the first output port on the local device.

Legend:
<out> **Output port number:**
Output number in 1 or 2 digit ASCII format (01,3,04 etc.)
<S/A>: **Affected ports:**
S = single selected output
A = all outputs
<num> **RICOD enable parameter on output:**
1: The RICOD functionality is enabled on the given output port. If a RICOD command is detected it will be executed. (If it is possible.)
0: The RICOD functionality is disabled on the given output port. Any incoming RICOD command will be rejected.

4.4.2. Query RICOD slave status on output

Description: Checks the previously set RICOD status for the selected output port of the local device.

Format		Example
Command	{:RICOD_SLEN#<out>@<S/A>O=?}	→ {:RICOD_SLEN#1@SO=?}
Response	(RICOD_SLEN#<out>@<S>O=<num>)CrLf	← (RICOD_SLEN#1@SO=1)CrLf

Explanation: RICOD functionality is enabled on the first output port on the local device.

Legend: Please read section 4.4.1 (Set RICOD slave status on output) on page 10.

5. Commands – Quick summary

RICOD MASTER commands	Section	Command
Set RICOD command on input	4.3.1	{:RICOD#<in>@<S/A>I=<A1><A2>;<B>;<C>;}
Query the set RICOD command on input	4.3.2	{:RICOD#<in>@<S/A>I=?}

RICOD SLAVE commands	Section	Command
Set RICOD slave status on output	4.4.1	{:RICOD_SLEN#<out>@<S/A>O=<num>}
Query RICOD slave status on output	4.4.2	{:RICOD_SLEN#<out>@<S/A>O=?}

6. An example application

An example connection variation with UMX4x4-Pro router and WP-UMX-TP-TX100 extenders are shown on Figure 6-1.

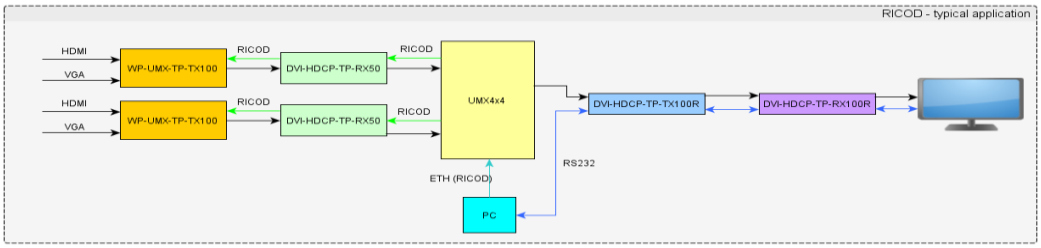


Figure 6-1. A typical application

6.1. Front panel operation on UMX4x4-Pro

The purpose of this chapter is to introduce the handling of Remote Input Control Over DDC on the UMX4x4-Pro's front panel. In UMX4x4-Pro, all RICOD-related settings are available from front panel LCD menu. This option can be found at the end of Input settings and the Output settings submenu for each port.

Warning! *The mentioned functions below are only a part of the UMX4x4-Pro's function capabilities. Please see the UMX4x4-Pro User's Manual for the whole menu description.*

6.1.1. CONTROL LOCK

Front panel button operations can be enabled or disabled using CONTROL LOCK button, while RS-232 and Ethernet control is still enabled. If the button is not illuminated, front panel button operations are enabled. If it illuminates red continuously, front panel operations are inhibited (including LCD menu).

Press and hold the CONTROL LOCK button for 3 seconds to toggle the control lock state.

Info: *Reaching RICOD settings via front panel is available only when the front panel buttons are unlocked*

6.1.2. Basic concept

One of the three operating modes of the LCD menu is the normal mode.

Normal mode — Most settings can be done in this mode. It is active when neither the EDID nor the SIGNAL PRESENT button is lit.
Use this mode to reach the RICOD settings.

6.1.3. Menu structure

Info: *Submenus and options affected by RICOD are bold.*

Normal mode

- Default display
- IP settings…
- Power status
- Firmware versions
- RS-232 settings
- View log…
- Factory reset
- Input settings
  - Interface
  - Audio
  - HDCP enabled
  - Analog video….
  - Analog audio….
  - **Remote input control….**
    - **RICOD master**
    - **Video source**
    - **Audio source**
    - **Return**
  - Return
- Output settings
  - Mode
  - Analog audio…..
  - HDCP
  - **RICOD slave**
  - Return
- HDCP keycounter

6.1.4. Navigation

The front panel LCD has 2 lines and 16 characters in each line. The left ◄ and right ► buttons can be used to scroll between menu items. Use the enter ◆ button to step into a submenu or to take changes. The up ▲ and down ▼ navigation buttons modify the value of the current menu item.

6.1.5. Normal mode

Main menu list

Left ◄ and right ► buttons select between menu items. Enter ◆ button steps into submenus or selects the adjustable values.

Default display

Default display activates after power up. This screen shows the current IP address, the current IP port and the serial number of the matrix.

```
192.168.002.045
10001   11230101
```

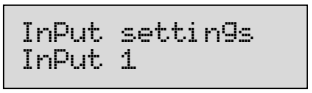
Info: *Use the navigation buttons to reach the input and the output settings where RICOD options can be set.*

Input settings

Navigate to this menu in the main menu list.

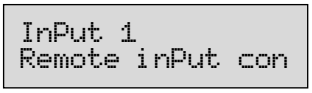
Select the input port

Use the up ▲ and down ▼ buttons to select the port that needs adjustment and then press the ENTER ◆ button.



Remote input control… submenu

Use the left ◄ and right ► buttons to select the remote input control… submenu and press the ENTER ◆ button to enter into it.



Use the left ◄ and right ► buttons to select the part, and then use the up ▲ and down ▼ buttons to change the value of that part.

Info: *Changes take effect immediately, don't need to press the ENTER ◆ button.*

RICOD master

RICOD master parameter can be:

- Disabled: The RICOD function is disabled on the local device's selected input port. It means the local device cannot send out RICOD commands to the controlled device over its input port. (Master mode is disabled on the selected input.)

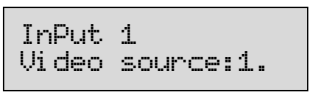
- Enabled: The RICOD function is enabled on the local device's selected input port and the remote controlled device is unlocked. It means the local device can send out RICOD commands to the controlled device over its input port. (Master mode is enabled on the selected input and the connected slave device is unlocked.)

- Enabled & slave lock: The RICOD function is enabled on the local device's selected input port and the remote controlled device is locked. It means the local device can send out RICOD commands to the controlled device over its input port. (Master mode is enabled on the selected input and the slave device is locked.)

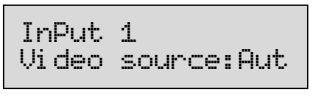
The video source selection of the remote device

"Video" parameter gives the remote device which video input port will be selected if it is available:

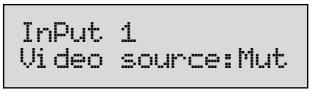
- From 1. input to 8. input: If the given input port is available on the remote controlled device it will be selected.



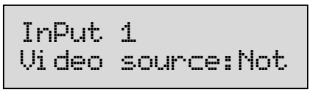
- Automatic: If Autoselect mode is available on the remote controlled device it will be selected.



- Muted: If output port muting is available it will be executed on the video layer.



- Not controlled: If audio switching or locking command is executed, the selected video input port won't be changed on the remote controlled device.

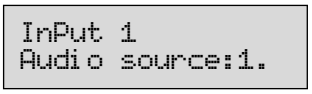


Info: *The LCD menu shows always 8 input ports to control regardless of the remote controlled device.*

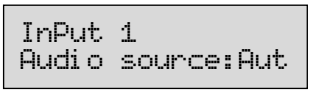
Info: *All the four cases will take effect only if the remote controlled device is able to perform the switching command. (e.g. If the remote controlled device is not able to mute its output port the mute command will be ignored.)*

The audio source selection of the remote device

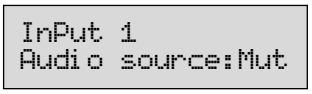
"Audio" parameter gives the remote device which audio input port should be selected if it is available:



- From the 1st input to the 8th input: If the given input port is available on the remote controlled device it will be selected.



- Automatic: If Autoselect mode is available on the remote controlled device it will be selected.
- Muted: If output port muting is available it will be executed on the audio layer.

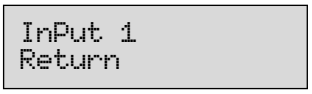


- Not controlled: If video switching or locking command is executed, the selected audio input port won't be changed on the remote controlled device.

Info: *The LCD menu shows always 8 input port to control irrespecetively of the remote controlled device.*

Info: *All the four cases will take effect only if the remote controlled device is able to perform the switching command. (e.g. If the remote controlled device is not able to mute its output port the mute command will be ignored.)*

Select the 'Return' to step back to the "Input settings" submenu.



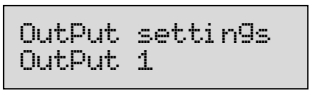
Select the 'Return' again to step back to the main menu.

Output settings

Navigate to this menu in the main menu list.

Select the output port

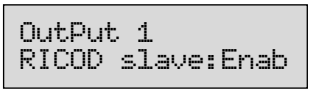
Use the up ▲ and down ▼ buttons to select the port that needs adjustment and then press the ENTER ◆ button.



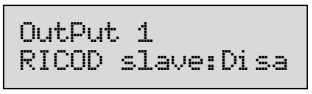
RICOD slave options

Use the left ◄ and right ► buttons to select the RICOD slave settings. Use the up ▲ and down ▼ buttons to change the value. It can be:

- **Enabled**: The local device is able to receive RICOD commands over its output port. (Slave mode is enabled on the selected output port.)

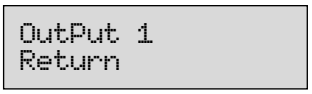


- **Disabled**: The local device is not able to receive RICOD commands on its output port. (Slave mode is disabled on the selected output port.)



Info: *Changes take effect immediately, don't need to press the ENTER ◆ button.*

Select the 'Return' to step back to the main menu.



7. Version applicability

This User's Manual applies to the following firmware versions of the mentioned devices:

	version
UMX4x4-Pro firmware	1.2.4r
WP-UMX-TP-TX100 firmware	1.1.0r
FP-UMX-TP-TX100 firmware	1.1.0r
UMX-TP-TX100R	1.1.6r
MX-CPU2 firmware*	3.3.5r

** The MX-FR series modular matrix frames with MX-CPU2 processor boards (with firmware version 3.3.5r and above) support reduced RICOD capabilities: only MASTER mode is available and only by protocol commands. RICOD SLAVE mode and the front panel operation are not implemented.*

8. Warranty

In case of defect please call your local representative, or Lightware at

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Fax.: +36 1 342 9903

E-mail: support@lightware.eu

9. Document revision history

Document	Release Date	Changes	Checked by
Rev. 1.1	03-03-2014	New RICOD capable devices: UMX-TP-TX100R, MX-CPU2 processor board, Minor changes	Zsolt Markó
Rev. 1.0	27-02-2013	Initial version	Zsolt Markó